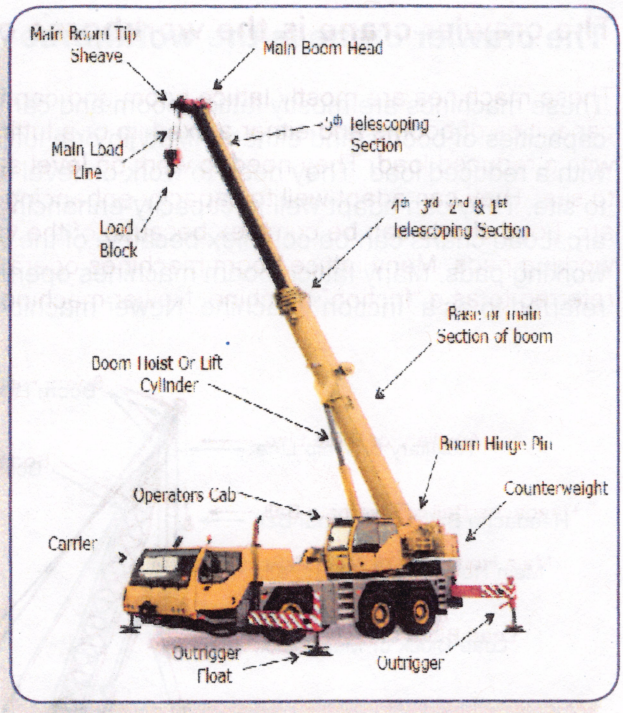
Module 4
Components



Learning Objectives

By the end of this section, you will:

1. Identify the primary characteristics of mobile cranes.
2. Know the advantages of different types of cranes.
3. Compare the advantages of a fixed jib to a luffing jib.
4. Identify good cab controls.
5. Identify the components for each type of crane in a diagram.

What are the primary characteristics of mobile cranes?

» Able to lift, transport and land loads.
» Adjustable boom lengths.
» Adjustable boom angles.
» Able to travel under their own power.

Types of Cranes

There are many types of mobile cranes. Cranes can be broken into a number of broad categories.

Crawler Mounted - Except for the base and method of load rating, these cranes are identical to carrier mounted cranes.

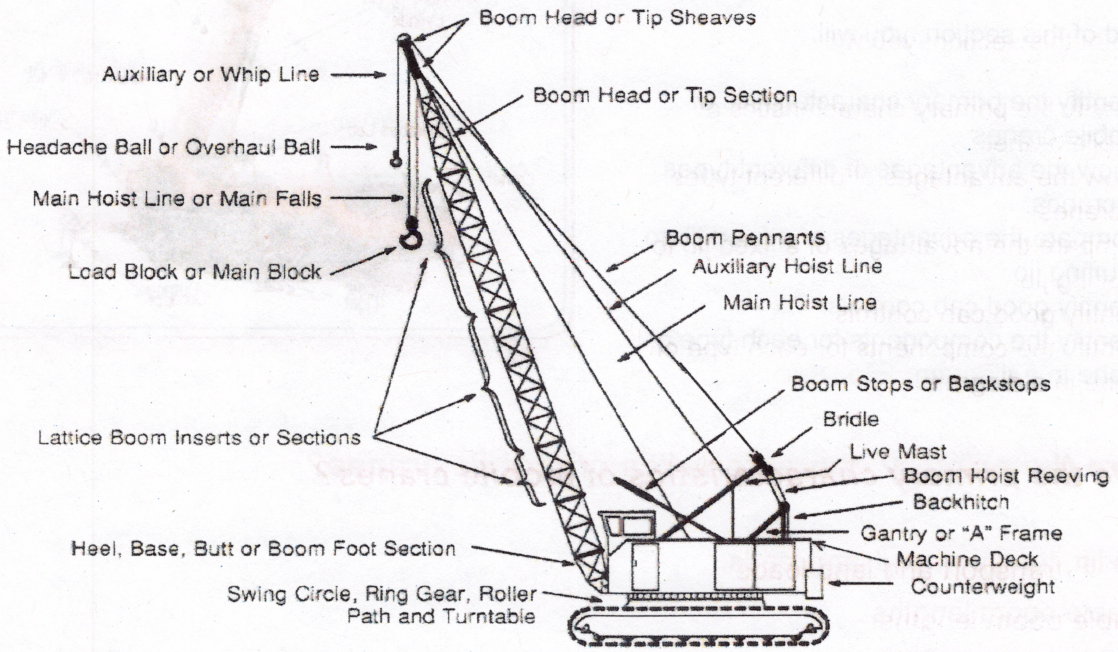
Carrier Mounted - Commonly referred to as truck cranes, conventional cranes and friction cranes. These are NOT the same as a commercial truck chassis, they are designed for heavy service.

Rough Terrain (RT) - Equipped with oversized tires for use in rough construction sites. Multiple steering capabilities.

All Terrain - They are a compromise between the RT and telescopic boom truck crane.

The crawler crane is the workhorse of the industry.

These machines are mostly lattice boom and can be configured with various lengths of inserts and capacities of booms and either a fixed jib or a luffing jib. They have a compact shape and can walk with a reduced load. They need to work on level and firm surfaces and are less mobile going from site to site. They can adapt well to capacity-enhancing attachments and enjoy a 360 degree operating arc. Load charts can be complex because of the various combinations and require specially prepared working pads. Many lattice boom machines operate with a clutch and brake system and therefore are referred to as a "friction" machine. Newer machines are controlled by hydraulic motors.

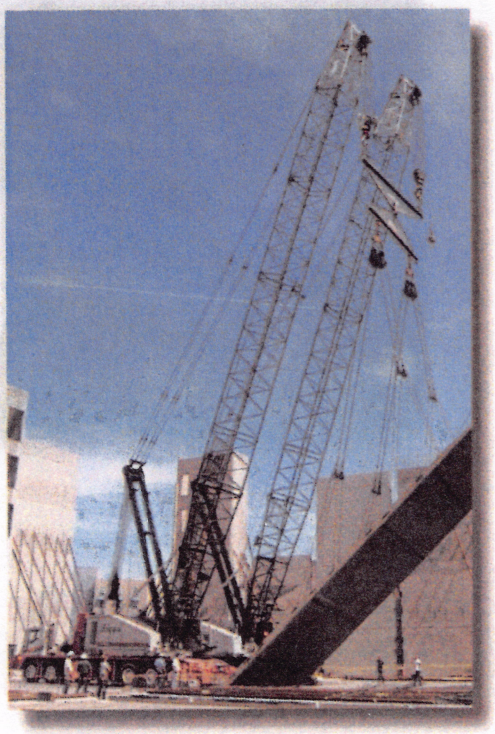


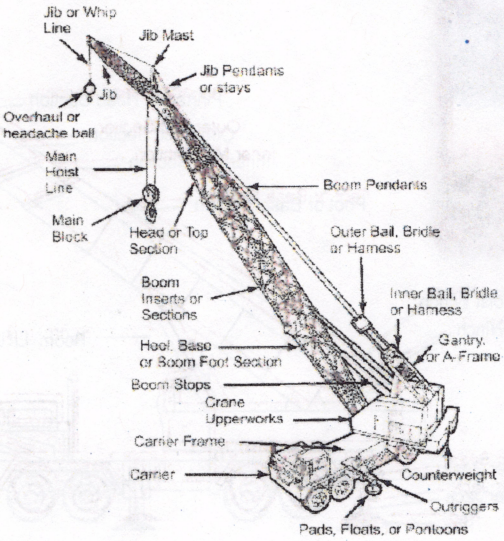
Telescoping boom crawler cranes are widely used at rough job sites.

This type was adapted to hydraulic crawler assemblies that has resulted in a subtle name change. They can walk with the load, can easily move from one setup to the next and are easily transported.

Lattice boom truck cranes have good site-to-site mobility and are able to travel at highway speeds.

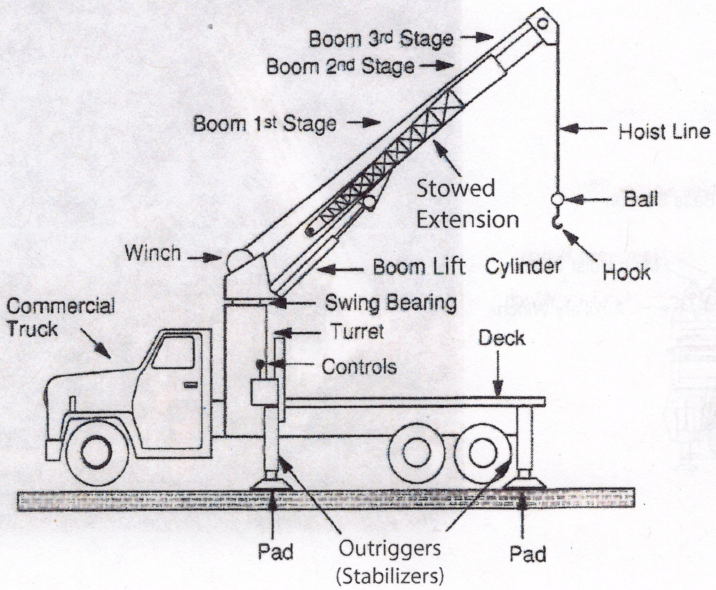
It is rare that these machines walk with the load or move around a site with a long boom. They can walk as long as the ground is compacted and close to level. Ground support for outrigger pads is more critical than with a crawler. Most are similar to comparable models on crawlers.



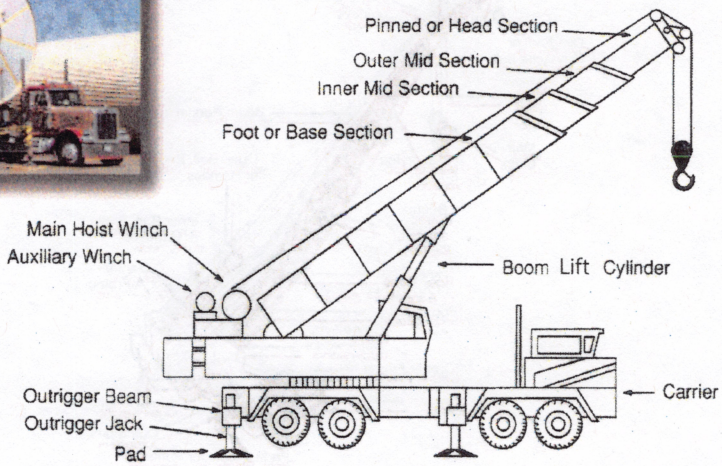


Boom trucks are well suited for small lifts.

They are easily set up, have excellent highway speed and are economic for the small user and owner. Articulated, boom trucks are now a major type. They have some restriction and limitation as other cranes.

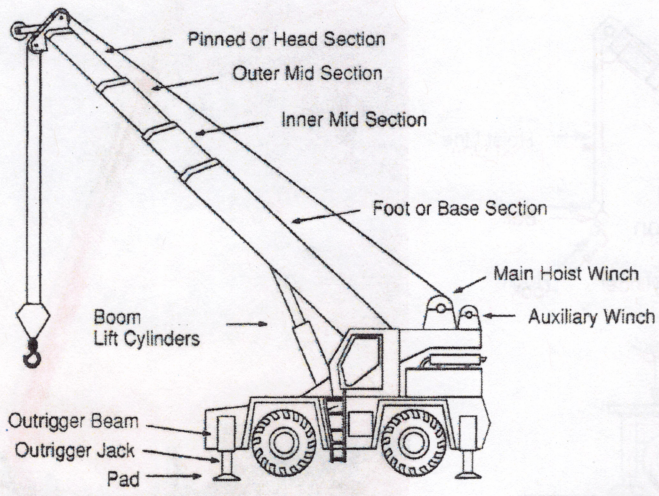


Hydraulic Truck Crane.



Rough terrain cranes (RT) are the new workhorse on construction sites.

They can pick and carry on rubber but capacity is limited. (See manufacturer's recommendations). They must be level to lift and travel. Recently capacities have increased significantly without adding to the weight and bulk that limited highway transport in the past.



All terrain cranes (AT) are a compromise between the RT and telescopic truck crane.

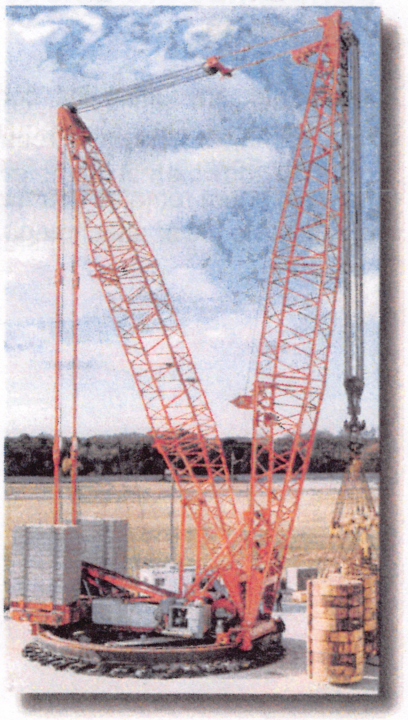
They can maneuver well on job sites. Their highway speeds are less than the truck crane and they frequently only have one engine. Capacities and assembly times are equivalent to a comparable truck crane. They usually have multiple axle drives and must be able to be leveled to lift. Pick and carry operations are limited to the manufacturer's charts.

Knuckleboom Crane Truck.

It is a standard crane, except that the boom articulates or folds near the middle, letting it fold back like a finger. This provides a compact size for storage and maneuvering. This machine is usually used for on-site delivery purposes.

Heavy lift cranes are another category with:

- Ringer.
- Trailing counterweight.
- Stiff leg derrick.
- Guy derrick.
- Extended heavy lift system.



They combine the best qualities of derricks and lattice boom cranes and are typically used with very large extended counterweights, masts, and roller rings that move the boom's fulcrum and the crane's tipping axis further away from the center of gravity.

All mobile cranes should have identification plates on all components and should list:

- Manufacturer's name.
- Machine model number.
- Serial number.

Jibs/Extensions

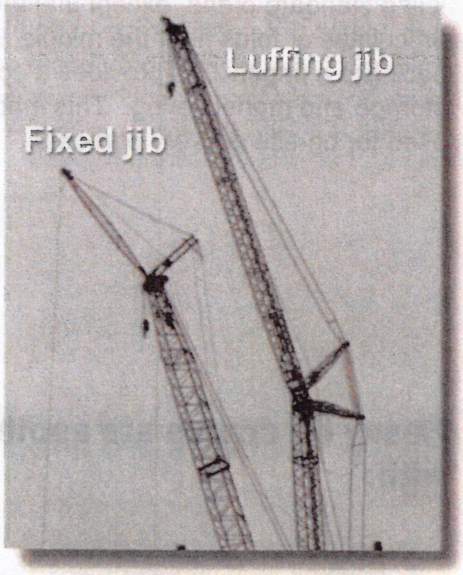
A jib is considered an auxiliary boom or boom extension.

It varies in length and can be used straight or at an angle to the main boom. It should always be used according to accompanying chart of safe working loads. It produces greater clearance between boom and jib hook.

The primary purpose of a jib is to increase height.

Fixed jibs/extensions maintain a "fixed" angle with the main boom.

They may be utilized on both lattice booms and telescopic booms. Erected jibs have a major effect on capacities and challenge some of the best crane operators during high winds. They can remain on most cranes during other lifting operations and there are no jib weight deductions when lifting from the jib.



Generally when lifting from the main boom with the jib erected the effective weight of the jib, and the ball and rigging must be deducted from the gross capacity.

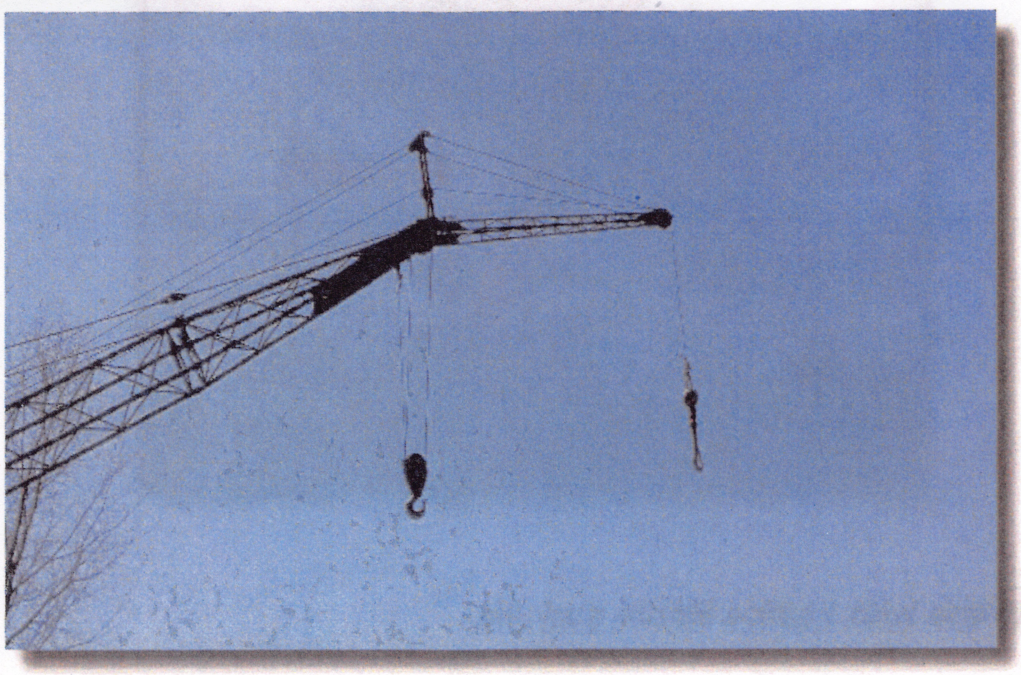
On hydraulic cranes, generally there are weight deductions for a stowed jib as well. (See load charts.)

Luffing jibs are able to vary angles during operations.

Jibs, particularly luffing jibs, complicate erection of boom and jib, as assembly of luffing jibs can be quite technical. They also require complex procedures for lowering which is critical when planning for boom lay-down areas in the event of storms or inclement weather. They can angle up and down while the main boom remains at a fixed angle. Luffing jibs can have very large capacities and have largely replaced the tower attachments found on older crawler and truck lattice cranes.

Jibs/extensions typically operate with a single fall of wire rope.

When the jib is erected, but not in use, working load for the boom must be reduced. Jib capacity may be greater on very long booms. Some crane jibs may require multipart reeving.

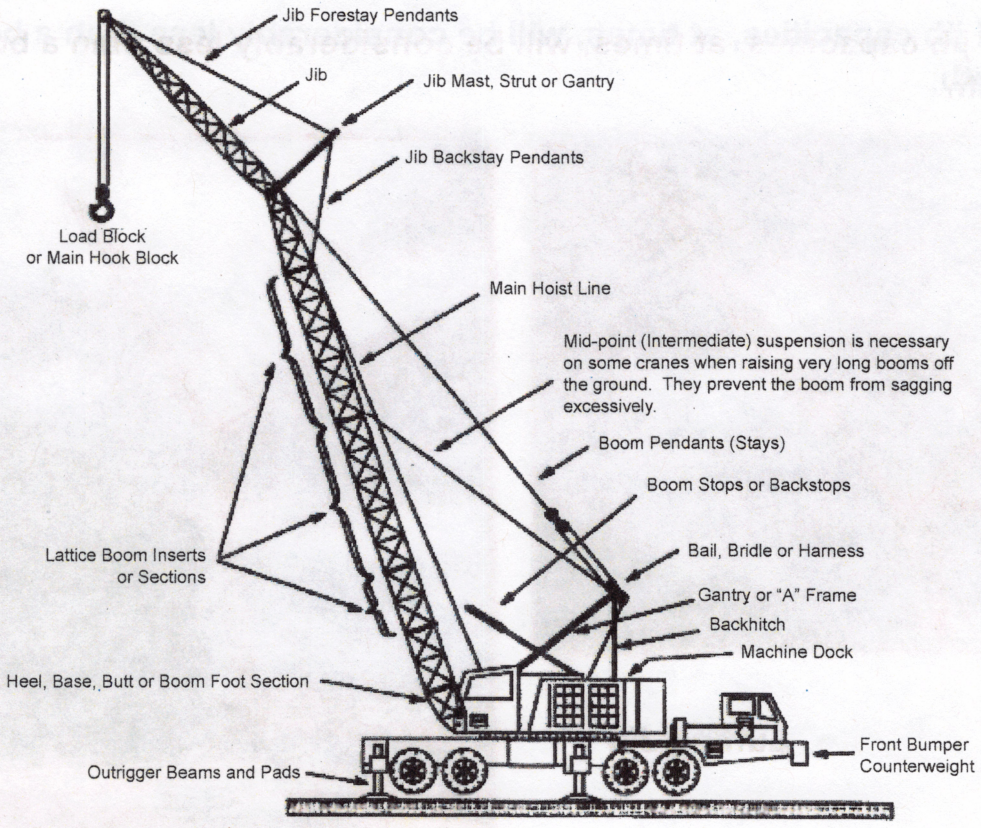


Boom and jib capacities, at times, will be considerably less than a boom of equal length.

Luffing Jib

When not in use, jibs and extensions should be stowed or stored.

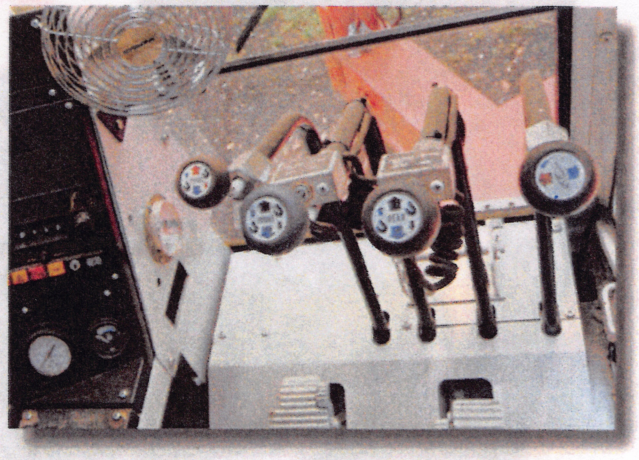
Truck Crane with Lattice Boom and Jib.



Crane Controls

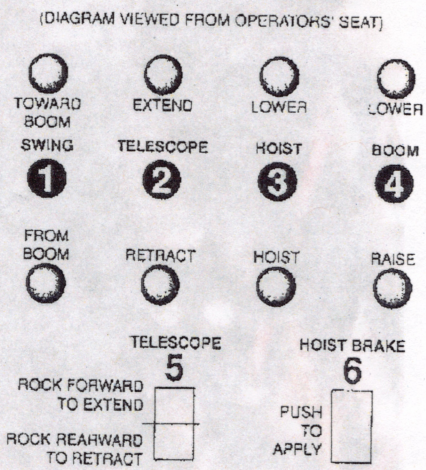
Crane cab controls conform to basic layout and design.

They need to be within easy reach and allow room for the operation. Some cranes have adjustable control levers. Load hoist, boom hoist and swing clutch must hold in neutral without positive latches. All controls must be clearly marked identifying their function. Controls move in direction of load movement. Control lever functions are affected by proximity to neutral and must have a clutch for disengaging power to the superstructure. Hand and foot controls must have force actuation limits and travel distance limits.



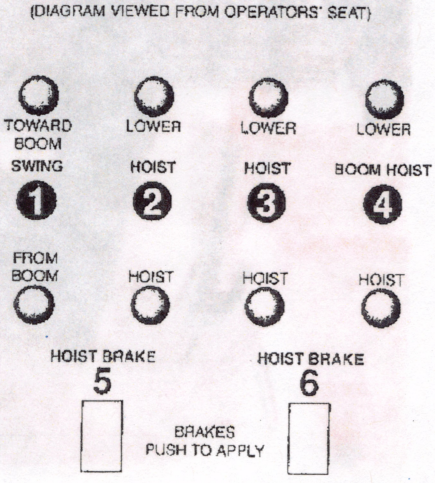
Typical Control Layout (hydraulic).

1. Swing control.
2. Telescoping control (if applicable).
3. Mobile control.
4. Boom control.
5. Telescoping pedal (if applicable).
6. Hoist brake (if applicable).



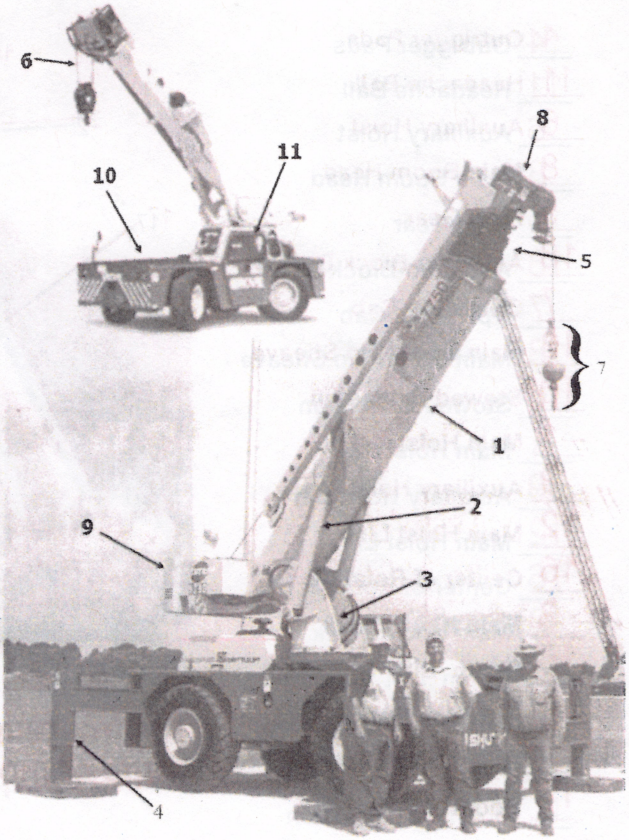
Typical Control Layout (conventional).

1. Swing control.
2. Hoist control #1.
3. Hoist control #2.
4. Boom hoist control.
5. Hoist brake #1.
6. Hoist brake #2.



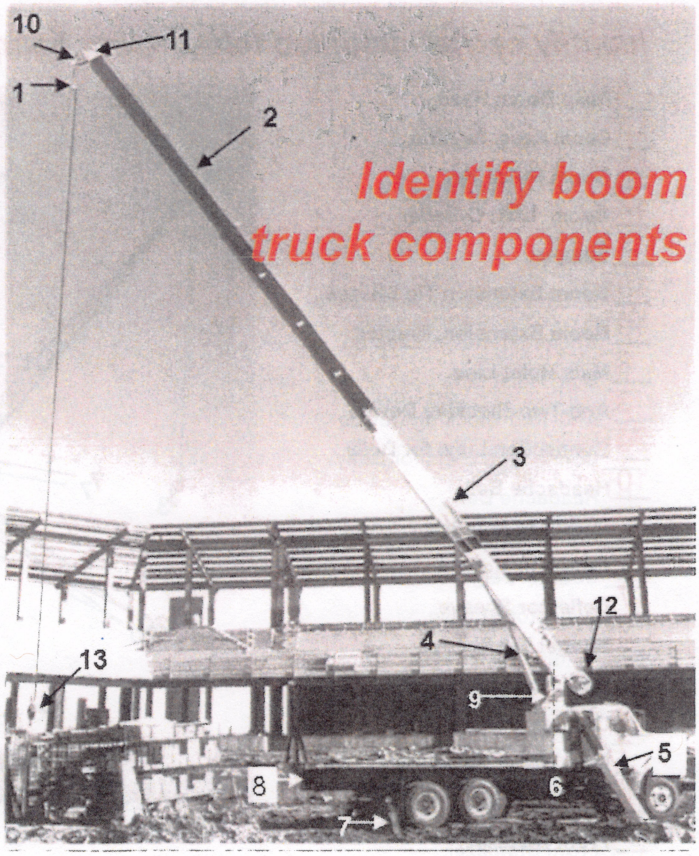
Cab of 11000 Manitowoc Crawler Crane.

Identify the carry deck components



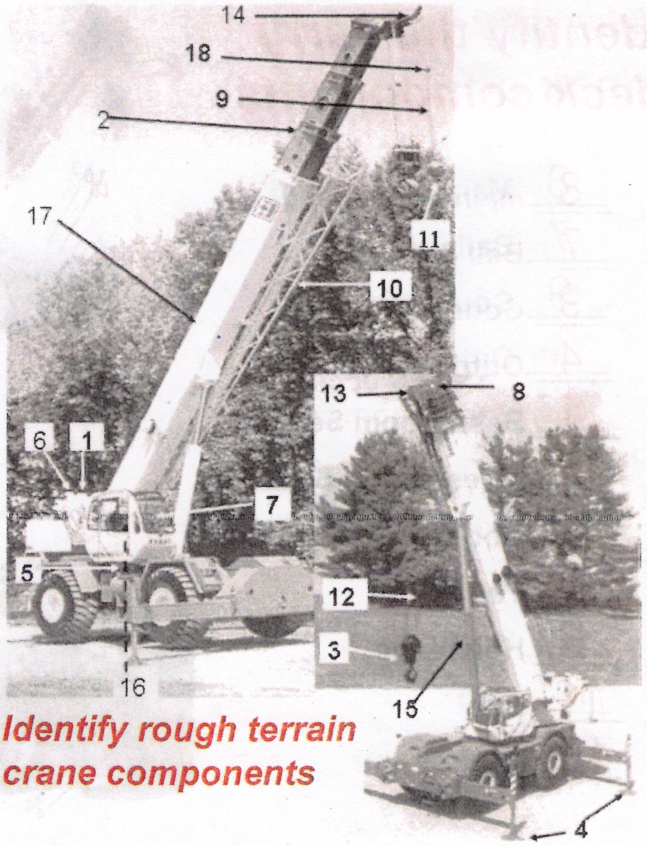
8 Main boom head
7 Ball & Hook
9 Counterweight
4 Outrigger Jack
1 Base Boom Section
5 Telescoping Sections
2 Boom Lift Cylinder
3 Turret
6 Hoist Line
11 Cab
10 Deck

Identify boom truck components



6 Center of Rotation
12 Hoist
2 Telescoping Boom
9 Turret or Pedestal
4 Boom Lift Cylinder
10 Boom Point Sheave
3 Boom Base Section
8 Truck Chassis
1 Anti-two-blocking device
11 Boom Head
5 Front Stabilizers
7 Rear Stabilizers
13 Overhaul Ball

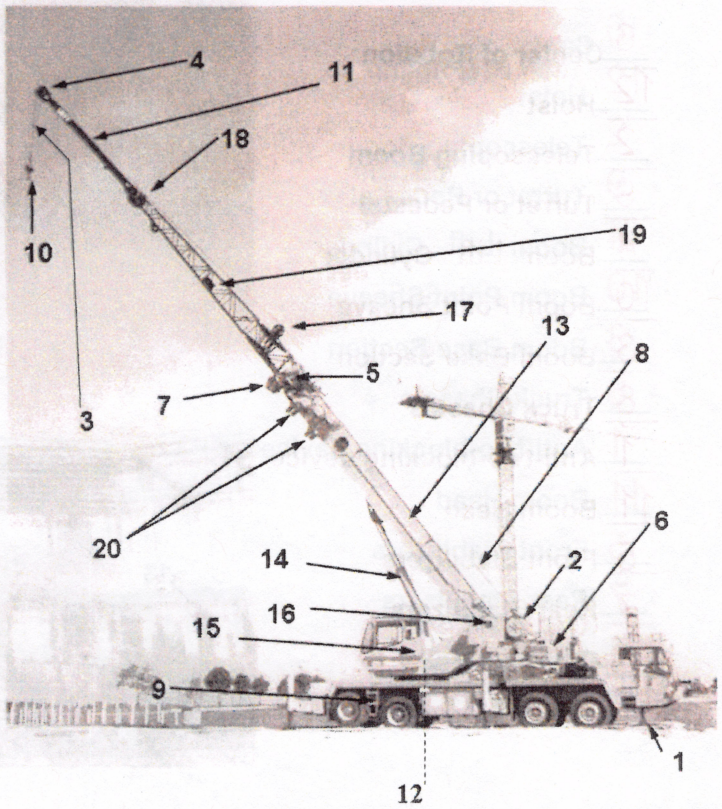
4 Outrigger Pads
11 Headache Ball
6 Auxiliary Hoist
8 Main Boom Head
5 Ring Gear
18 Anti-Two-Block Device
7 Operators Cab
13 Main Boom Tip Sheave
10 Stowed Extension
1 Main Hoist
9 Auxiliary Hoist Line
12 Main Hoist Line
16 Center of Rotation
3 Main Hook Block
15 Boom Lift Cylinder
14 Auxiliary Boom Head
2 Telescopic Sections
17 Boom Base Section



Identify rough terrain crane components

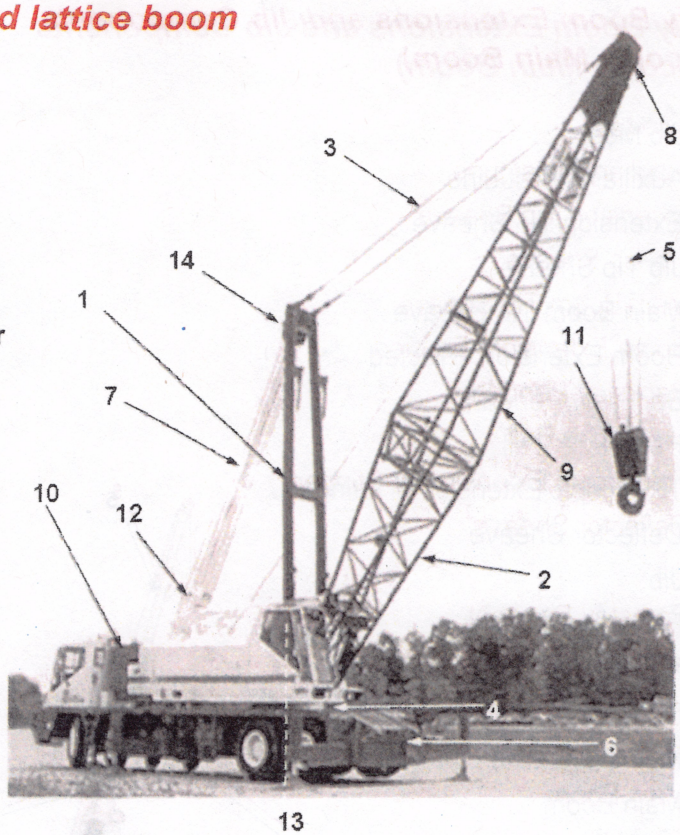
Identify carrier-mounted telescoping boom crane components

5 Main Boom Head
13 Boom Base Section
16 Boom Hinge Pin
14 Boom Lift Cylinder
11 Stinger
18 Boom Extension Tip Sheave
19 Boom Extension, Erected
8 Main Hoist Line
3 Anti-Two-Blocking Device
20 Connection Lugs for Dolly
10 Headache Ball
12 Center of Rotation
6 Counterweight
17 Deflector Sheave
4 Stinger Tip Sheave
2 Main Hoist
9 Carrier
7 Main Boom Tip Sheave
15 Upper Works
1 Front Stabilizer



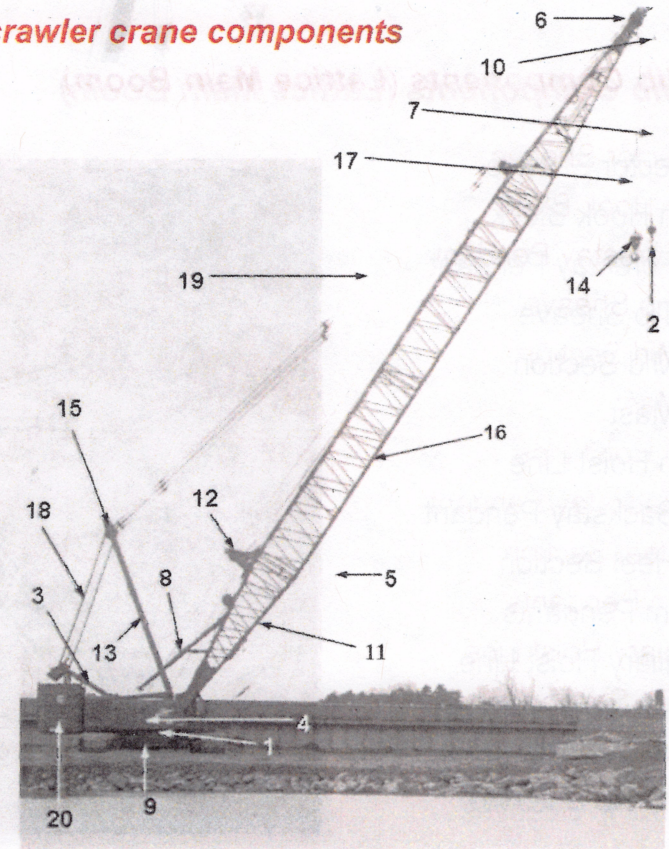
Identify carrier-mounted lattice boom crane components

10 Counterweight
11 Main Hook Block
7 Boom Hoist Reeving
13 Center of Rotation
4 Turntable or Ring Gear
1 Live Mast
6 Carrier
2 Boom Heel Section
5 Main Hoist Line
3 Boom Pendants
14 Bridle
8 Boom Tip Sheave
12 Inner Bail
9 Boom Tip Section

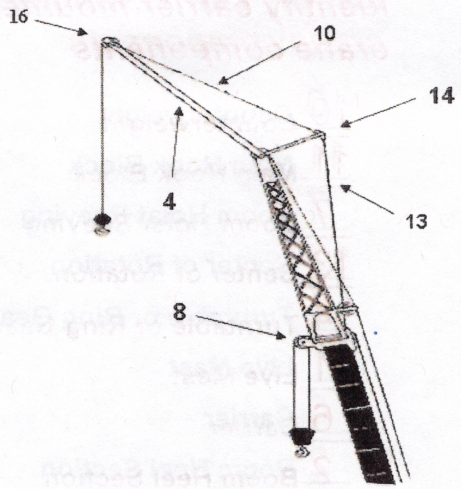


Identify lattice boom crawler crane components

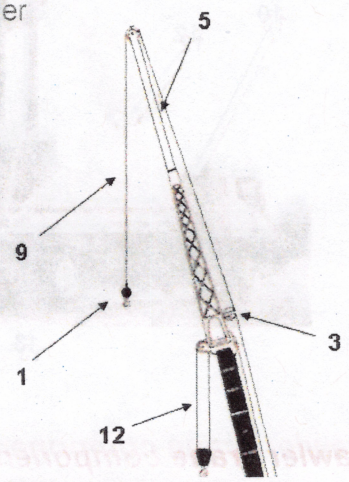
20 Counterweight
14 Main Hook Block
18 Boom Hoist Reeving
13 Live Mast
1 Turntable or Ring Gear
3 Gantry
17 Main Hoist Line
11 Boom Base Section
19 Boom Pendants
7 Auxiliary Hoist Line
15 Outer Bail
2 Headache or Overhaul Ball
4 Super Structure
6 Boom Tip Sheaves
10 Anti-Two-Blocking Device
8 Boom Stop
12 Guide Sheave
5 Third Line
16 Boom Insert
9 Carbody

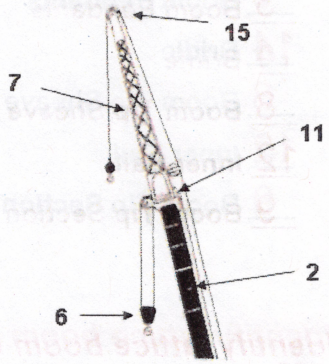


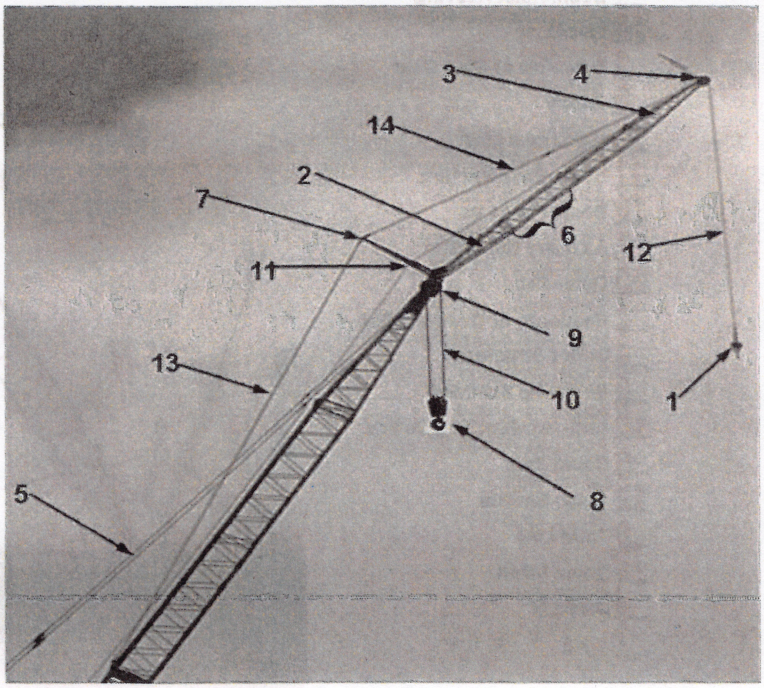
Identify Boom Extensions and Jib Components (Telescopic Main Boom)



14 Jib Mast
9 Auxiliary Hoist Line
15 Extension Tip Sheave
16 Jib Tip Sheave
8 Main Boom Tip Sheave
7 Boom Extension, Erected
13 Backstay Pendant
1 Headache Ball
5 Telescopic Extension or Stinger
3 Deflector Sheave
4 Jib
10 Forestay Pendant
11 Main Boom Head
6 Hook Block
12 Main Hoist Line
2 Main Boom





Identify Jib Components (Lattice Main Boom)

11 Deflector Sheave
8 Main Hook Block
14 Jib Forestay Pendant
4 Jib Tip Sheave
6 Jib Mid Section
7 Jib Mast
10 Main Hoist Line
13 Jib Backstay Pendant
2 Jib Heel Section
5 Boom Pendants
12 Auxiliary Hoist Line
3 Jib Tip Section
1 Headache or Overhaul Ball
9 Boom Tip Sheaves